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A 02

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Dear Sir or Madam:

We herewith submit a copy of a manuscript of a poster presentation that is being made at Polyurethanes Expo '98. The enclosed report does not contain any Confidential Business Information.

"*In Vivo* Evaluation of MDI Skin Decontamination Procedures"

by Ronald C. Wester, Xiaoying Hui, Timonthy D. Landry and Howard I. Maibach

Name of Chemical Substance:	benzene 1, 1` – methyleñebis (isocyanato-
Chemical Abstracts Service Number:	26447-40-5
Abbreviation:	MDI

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Very truly yours,

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A 04

For Polyurethanes Expo '98
9/1/98 TD Landry

In Vivo Evaluation of MDI Skin Decontamination Procedures

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[1]Department of Dermatology, UCSF
[2]Health and Environmental Research Laboratory, The Dow Chemical Co.

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ABSTRACT

Water or soap-and-water cleaning has been a traditional first aid procedure for skin decontamination in the workplace. Methylene diphenyl diisocyanate (MDI) skin exposure is a concern because it may cause skin irritation, sensitization and may play a role in respiratory sensitization. Because MDI has higher miscibility with oil or polyglycols, there may be more effective means for decontaminating skin. To assess this, 14C-MDI was applied to one cm^2 sites on the abdomen of monkeys, then a cleaning procedure utilizing a cotton swab with water, soap-and-water (5% or 50%), corn oil, polypropylene glycol, or a polyglycol-based skin cleanser was performed. Following cleaning at 5 minutes, 1 hour, 4 hours, or 8 hours; cellophane tape was used to check the skin for remaining radioactivity. Although all the cleaning procedures helped remove MDI to some extent, water or soap-and-water was generally less effective than corn oil, polypropylene glycol, or polyglycol-based skin cleaner. Cleaning soon after exposure was important; water or soap-and-water in particular was less effective at 4 or 8 hours. The lower amount of MDI in the outer epidermis (stratum corneum) reflected the greater effectiveness of corn oil and suitable polyglycol materials to clean skin. Although cleaning is useful, it did not completely remove skin contamination. Good work practices, engineering controls, and personal protective equipment should be the first defense to avoid skin exposure. This study showed that a rapid response is important if skin contamination occurs and these non-traditional cleaning materials may remove MDI more effectively than soap-and-water.

A 05

Introduction

- MDI may cause skin irritation and sensitization, and may play a role in respiratory sensitization
- A very small proportion of MDI applied to skin (of rats) was absorbed into the bloodstream[a]
- What is the best first aid procedure for decontaminating skin of uncured MDI?

[a] Hof'mann, et al., (1998). Dermal pharmacokinetics of 4,4'-MDI in rats. Report to the International Isocyanate Institute, Inc. (in preparation).

Introduction (continued)

- Harsh solvents may enhance dermal penetration
- MDI has greater miscibility in oil and polyglycol than water
- Food oil or suitable polyglycols may be more effective decontaminants than soap and water

A 06

Materials and Methods

- The rhesus monkey is a suitable model for assessing dermal absorption[b]
- Utilized a grid with 24 separate one cm^2 sites on the abdomen of each of four monkeys
- ^{14}C-MDI added to polymeric MDI
- 2 µl of polymeric MDI (0.5 µCi) per site
- Site cleaned at 5 min, 1 hr, 4 hr, or 8 hours

[b] Wester and Maibach, (1997). Comprehensive Toxicology, Elsevier.

Methods (continued)

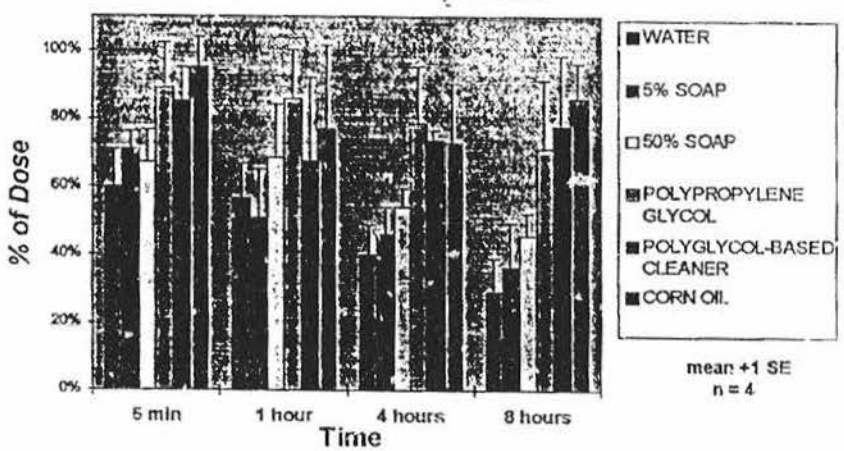
- Cotton swab with test cleaner (5 times per site)
  - water
  - soap-and-water (5% or 50%)
  - polypropylene glycol (m.w. 700)
  - polyglycol-based cleanser (D-TAM[c] cleanser)
  - corn oil
- The type and molecular weight of polyglycol may be important:
  - low m.w. materials might be absorbed
  - high m.w. materials may be solid, not liquid
- Tape stripping of epidermis (10 times per site)

[c] CLI Laboratories

A 07

Results

14-C in Skin Washes



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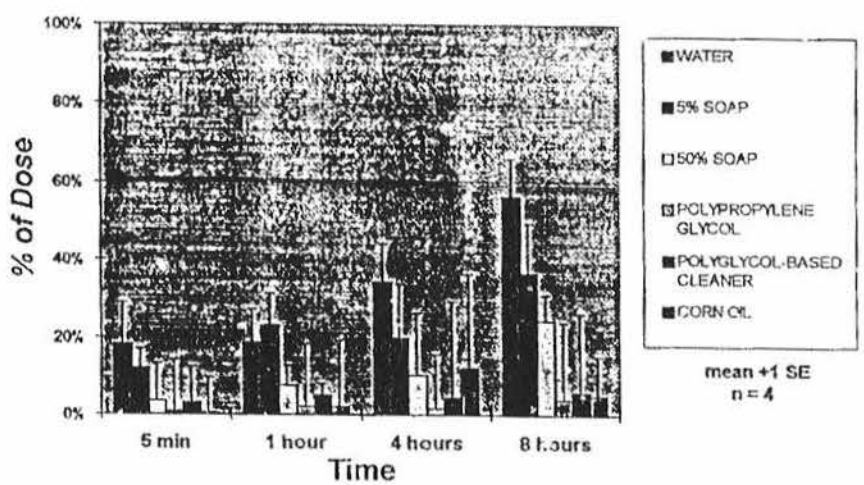
14-C in Outer Epidermis (tape)



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Conclusions

- Each of the cleaning procedures helped to remove some, but not all MDI
  - Work practices, engineering controls, and personal protective equipment should be the first defense against skin contamination
- Washing sooner is generally more effective

9

Conclusions

- Corn oil, polypropylene glycol, and polyglycol-based cleaner are generally more effective (especially at 4 & 8 hrs) than water
  - More 14-C was in wash, less on epithelial surface
- Results are consistent with the relative miscibility of MDI in oil and polyglycol

10

A 09

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